



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10**

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REGIONAL
ADMINISTRATOR'S
DIVISION

October 4, 2021

Serena Sweet, Project Lead
Bureau of Land Management
222 West 7th Avenue, #13
Anchorage, Alaska 99513-7599

Dear Serena Sweet:

The U.S. Environmental Protection Agency (EPA) has reviewed the Bureau of Land Management (BLM) Notice of Intent (NOI) to Prepare a Supplemental Environmental Impact Statement (SEIS) for the Coastal Plain Oil and Gas Leasing Program, Alaska. Our review of the NOI was conducted pursuant to EPA's responsibilities under the National Environmental Policy Act (NEPA), Section 309 of the Clean Air Act, and the Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500 - 1508). EPA provided comments in June 2018 on the NOI, in March 2019 on the Draft Environmental Impact Statement (DEIS), and in October 2019 on the Final Environmental Impact Statement (FEIS) for the Coastal Plain Oil and Gas Leasing Program. BLM issued a Record of Decision (ROD) in August 2020.

The NOI describes BLM's proposal to analyze the potential impacts of the Coastal Plain oil and gas leasing program located within the roughly 19.3 million-acre Arctic National Wildlife Refuge (ANWR). This NOI is in response to the June 1, 2021 Secretary of the Interior Order 3401, which directs BLM to complete a new comprehensive analysis of the potential environmental impacts of the Program to address identified legal deficiencies.

BLM is requesting comments on potential alternatives that would designate certain areas of the Coastal Plain as open or closed to leasing; permit less than 2,000 acres of surface development throughout the Coastal Plain; and/or prohibit surface infrastructure in sensitive areas. BLM will also analyze potential impacts to various surface resources including caribou, polar bears, birds, vegetation, and surface waters. The NOI states that new analysis will also focus on subsistence uses and consider impacts from greenhouse gas (GHG) emissions from the proposed leasing program.

EPA's comments are enclosed for BLM's consideration. In addition to our comments, EPA encourages BLM to establish an interagency technical workgroup that collaboratively works on analyzing air quality topics concerning impacts to local communities.

Thank you for the opportunity to review the scoping notice for this project. If you have questions about this review, please contact Lauren Boldrick of my staff at (907) 271-5097 or boldrick.lauren@epa.gov, or me, at (206) 553-1774 or at chu.rebecca@epa.gov.

Sincerely,

Rebecca Chu, Chief
Policy and Environmental Review Branch

Enclosure

EPA OCTOBER 2021 DETAILED COMMENTS ON THE NOI FOR COASTAL PLAIN LEASING PROGRAM

General

We recommend the SEIS include a clear and concise statement of the underlying purpose and need for the proposed project, consistent with the implementing regulations for NEPA. An appropriately defined purpose and need statement is of critical importance to setting up the analysis of a range of reasonable alternatives in the SEIS.

In presenting the purpose and need, the SEIS should reflect the BLM's purpose in complying with the Tax Cuts and Jobs Act of 2017 (Tax Act) and the broader public interest and need for this project. EPA notes that the 2019 Coastal Plain ROD includes an interpretation of the 2,000-surface development acre limit included in the Tax Act that is different from the interpretation included in the 2019 FEIS. Section 20001(c)(3) of the Tax Act states, that "the Secretary shall authorize up to 2,000 surface acres of Federal land on the Coastal Plain to be covered by production and support facilities (including airstrips and any area covered by gravel berms or piers for support of pipelines) during the term of the leases under the oil and gas program under this section". While the FEIS included an interpretation of production and support facilities that would count toward the 2,000-acre limit "any type of gravel or other fill constructed facility which touches the land," including, "[g]ravel pads used for production or processing facilities (including wells), pump or compressor stations, and lodging facilities for workers, [g]ravel airstrips or roads, [a]ny other area covered by gravel berms or piers for support of pipelines,"¹ as well as gravel mines, the ROD narrowed the interpretation of production and support facilities such that it no longer included some of the facilities contemplated in the FEIS as counting towards the 2,000-acre limit. This new ROD interpretation suggests that BLM would allow surface disturbances to go beyond the 2,000-acre limit included in the Tax Act. In addition, the 2,000-acre surface development limit in the Tax Act does not mandate BLM authorize 2,000 acres for surface development. Instead, the Tax Act states that BLM "shall authorize up to 2,000 surface acres." EPA reiterates its recommendation that the proposed action restrict surface development to up to 2,000 acres cumulatively over the leasing program and agrees BLM should consider alternatives that permit less than 2,000 acres of surface development throughout the Coastal Plain, as indicated in the NOI.

Habitats

In the NOI, BLM solicited input for potential new alternatives to be considered in the SEIS regarding the possible designation for certain areas of the Coastal Plain as open or closed to leasing. EPA recommends leasing only within the area of high petroleum potential as shown in the 2019 FEIS. We have focused our recommendations on those resources that are the subject of BLM's NOI (caribou, polar bears, birds), and their respective habitats that are within the Coastal Plain. This is because these biological resources are either an endangered species or core species of utmost importance for subsistence use. EPA recommends analyzing the closure of these areas as a stipulation, mitigation measure or alternative, specifically:

- **Designated Critical Habitats used by the Southern Beaufort Sea (SBS) population of polar bears:** The US Fish and Wildlife Service (USFWS) recognized in its June 2021 Stock Assessment that this population of polar bears has suffered significant population declines and is determined to be around 728 animals using the Minimum Population Estimate.² This decline is most likely caused by loss of sea ice due to climate change. This population's use of terrestrial habitats has been increasing as sea ice cover has declined. The Intergovernmental Panel on Climate Change (IPCC) anticipates global warming will continue to amplify permafrost thawing, and loss of seasonal snow cover, of land ice and of Arctic sea ice. Modeling predicts the Arctic will be sea ice free months later than normal.³ These land and oceanic changes will directly impact the sustained existence of this stock. With respect to these changing habitat

¹ 2019 FEIS 1-7.

² 16 U.S.C. §§ 1361 et seq. Enacted as: the "Marine Mammal Protection Act of 1972", on October 21, 1972.

³ IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-DeMotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.

conditions, EPA suggests blending the previously proposed lease stipulations to holistically restrict much of the eastern and middle portion of the Coastal Plain to protect the SBS population of polar bears. Combining these protections still allows for exploration and development to occur but minimizes the potential impacts of these operations. We find this pragmatic because the 2019 FEIS estimated that only 427,900 acres were projected to have high potential for petroleum resources, located in the western portion of the Coastal Plain. We note that the FEIS showed a high use area for maternal dens between the Katakturuk River and Sadlerochit River, which is in the medium hydrocarbon potential area. The FEIS also noted that very little oil and gas exploration has occurred in this area, and there are no proven plays at this point. EPA finds it reasonable to protect the known critical habitats as much as possible, instead of making available lands which have unknown, low, or medium petroleum resource potential.

- **Migratory Bird and Endangered Species Habitats:** The National Wildlife Refuge System, which the Alaska National Wildlife Refuge is a part of, was created to protect immense areas of wildlife and wetlands in the United States. This refuge system created the Migratory Bird Treaty Act of 1918, which is intended to ensure the sustainability of populations of all protected migratory bird species. The lands within the Coastal Plain program area have been set aside to protect migratory birds and their habitats as part of the United States' treaty obligations. EPA provides several recommendations later in this document regarding how impacts to wetland habitats and migratory birds, specifically those resulting from climate change and accidental oil spills, should be analyzed in the SEIS. Based on the potential cumulative impacts from the Coastal Plain leasing program and climate change, we again recommend leasing lands only in the high petroleum production potential area and analyzing alternatives which protect migratory bird habitats.
- **Porcupine Caribou Herd (PCH) Calving and Post-Calving Areas:** EPA finds it reasonable to protect the known caribou habitat within the Coastal Plains which have unknown, low, or medium petroleum resource potential. The Alaska National Interest Lands Conservation Act (ANILCA) requires areas within the Arctic National Wildlife Refuge, which includes the Coastal Plain, be managed for the specific purpose of conserving fish and wildlife populations and their habitats. Leasing of lands within the Coastal Plain is likely to have significant impact on the flora and fauna that reside within it. This, in turn, will likely directly impact the integrity of the subsistence way-of-life practiced by the Alaskan Native communities that use those resources. EPA recommends blending the previously proposed lease stipulations to holistically restrict much of the eastern portion of the Coastal Plain to protect the PCH and its important habitats (i.e., calving, and post-calving areas). Combining these protections allows for exploration and development to occur and minimizes the potential impacts.

Alternatives

Surface Development

As stated in the EPA's comment letter on the 2019 FEIS, we recommend BLM analyze alternatives or mitigation measures that restrict surface development to up to 2,000 acres cumulatively over the leasing program. We also recommend BLM analyze, as an alternative or mitigation measure, restricting surface development to only development projects. In doing so, BLM would be able to ensure the protection of quickly diminishing permafrost; acknowledge that revegetation is challenging in arctic environments; and, most importantly, ensure that permitted activities do not create human health risks by contaminating subsistence foods or cause substantive interference with subsistence way-of-life practices.

The NOI states that BLM is considering permitting less than 2,000 acres of surface development throughout the Coastal Plain. EPA recommends that the SEIS analyze leasing alternatives for approximately 660 and 1,155 cumulative surface acres for development in the Coastal Plain program area. We developed this acreage estimate using ConocoPhillips's Alpine Development as our analytical model, basing our assessment on two factors: reservoir access capability and cumulative recovered reserves. Using the Alpine Development as the analytical model for reservoir access capability, about 4 developments (660 surface acres) would be necessary to reach targets in the whole of the 427,900 acres that are projected to have high potential for petroleum resources within the Coastal Plain program area. By using the reported recoverable reserves and production capacity of the Alpine

Development, about 7 developments (1,155 surface acres) would be needed to extract the 3.4 billion barrels of technically recoverable oil that is likely to be produced by 2050⁴ within the Coastal Plain program area.

Renewables

EPA recommends that BLM analyze an alternative that incorporates the potential of large-scale renewable energy projects acting as an alternative energy source by using projects that have permit applications in queue with the State of Alaska or the U.S. Federal Government.

Air Quality

Analysis

EPA recommends that the SEIS include a quantitative air quality analysis of future project-specific proposals. As stated in our 2019 DEIS and 2019 FEIS letters, we found the FEIS qualitative analysis of impacts to air quality and air quality related values to be incomplete. We recommend focusing on proposed projects that would exceed a project-level Prevention of Significant Deterioration increment or cause ambient conditions to exceed a National Ambient Air Quality Standard (NAAQS)/Alaska Ambient Air Quality Standard (AAAQS), or an air quality related value threshold. We note that the FEIS stated that future project-specific proposals in the Coastal Plain are not anticipated to exceed a project-level Prevention of Significant Deterioration increment or cause ambient conditions to exceed a NAAQS/AAAQS.

Additionally, production-related air emissions may result in levels of exposure that are unsafe for vulnerable populations/communities with environmental justice (EJ) concerns located near oil and gas production sites. We recommend that this potential for localized human health impacts to sensitive populations be evaluated in the SEIS as part of the cumulative analysis. Specifically, EPA recommends the analysis look at potential air quality impacts to the community of Kaktovik, including hazardous air pollutants, and potential impacts to air quality related values in the ANWR.

Biological Resources

EPA recommends conducting an analysis of the specific lichen species within the program area to determine the sensitivity of those species to the anticipated air pollutants from production activities. Lichen populations within ANWR face many different stressors. Lichens have been shown to be negatively affected by climate change due to warming and drying trends. These effects on lichen will likely be further exacerbated by common air pollutants of the oil and gas industry such as sulfur dioxide.⁵ The cumulative effects of these stressors may lead to lichen having difficulty regenerating. This may further negatively impact caribou populations which depend on lichen as a food source.

Heavy Fuel Oil

We recommend analyzing the cumulative impacts of heavy fuel oil (HFO), which propels most of marine transport. HFO is important to analyze since it emits black carbon which is a short-lived pollutant that exacerbates global warming. As Arctic sea ice melts, and transportation through the Arctic Circle during the summer months becomes more frequent, it is important to capture these potential impacts in BLM's analysis. It is important to

⁴ It was reported that ConocoPhillips's Doyon 26 rig is designed to reach targets seven surface miles away, which means that it is able to reach targets within an area of about 154 surface square miles or 98,522 surface acres. This aligns with ConocoPhillips's disclosures that the Alpine Development is able to access about 40,000 subsurface acres of its targeted reservoir; we note that it does so by using a reported 165 acres of surface developments. Regarding production capacity, we note that the 2019 FEIS stated that the program area contains an estimated mean of 7.687 billion barrels (BBL) of technically recoverable oil and 7.04 trillion cubic feet of technically recoverable natural gas. The FEIS also stated that the US Energy Information Agency estimated that the Coastal Plain contains about 3.4 BBL of technically recoverable oil that is likely to be produced by 2050; we used this value in our calculations. Using the Alpine Development as the analytical model, it was planned to produce about 430 million barrels of recoverable reserves over its design life; however, it was reported that the combined pool had produced 504.4 million barrels of oil cumulative since startup. EPA used the reported combined pool production value. We note that production is ongoing.

⁵ USFS. Lichens and Air Quality Monitoring. gis.nacse.org/lichenair/index.php?page=pnw_sensitivity. Accessed August 2021.

distinguish in the analysis the potential impacts that may occur related to development and production of sites within the program area, and also global shipping trends that are anticipated to occur. We note that burning and carrying HFO has been banned in Antarctic waters since 2011, so it may be useful to analyze a mitigation measure that prevents its use on any vessels associated with the development or export of petroleum hydrocarbons that originate from the Coastal Plain.

Working Group

EPA recommends that BLM establish a technical workgroup to determine an appropriate methodology for a quantitative air quality analysis to support this planning-level decision, beginning with the development of an emissions inventory. As previously commented in 2019, EPA finds that representative, quantitative analysis is often conducted for NEPA analyses at the oil and gas planning stage. Additionally, existing data and information are available to conduct such an analysis to support informed decision making for oil and gas leasing in the Coastal Plain. Historical cumulative analysis conducted for oil and gas developments by BLM or Bureau of Ocean Energy Management on the North Slope have traditionally not included the Coastal Plain program area since it does not have existing infrastructure. This analysis could be streamlined by using the modeling platform under development for the North Slope Regional Air Quality Model.

Mitigation

EPA recommends that BLM begin development of an ambient air quality monitoring program to determine baseline air quality conditions at Kaktovik and at lease block locations on the Coastal Plain where development is most likely to occur. This program, which may be considered a mitigation measure, is a practicable and reasonable means to avoid or minimize harm to human health and the environment.

Climate Change

EPA recommends that BLM reevaluate how it analyzes and explains climate change information in the SEIS. To do this, we encourage BLM to incorporate information from the IPCC report.⁶ EPA is concerned that in the 2019 FEIS, BLM's representations of the impacts of climate change were inaccurate (i.e., there is not a climate crisis).⁷ The FEIS neglected to acknowledge that at that time referenced (about 1,000 years ago), the atmospheric concentration of CO₂ was approximately 278 parts per million;⁸ today it is approximately 409.8 parts per million.⁹ CO₂ accounts for by far the largest share of radiative forcing since 1990, and its contribution continues to grow at a steady rate. It is unequivocal that human influence has warmed the atmosphere, ocean, and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.¹⁰ Specifically, greenhouse gases produced by human activities have caused an overall warming influence on the Earth's climate since 1750.¹¹ Therefore, it is important to describe and clarify that the rate of change by which atmospheric CO₂ is increasing is the primary cause for concern, since the resulting positive radiative forcing is currently causing global warming to occur within an unnatural cycle. It is important to rectify inaccurate statements and the underlying analyses regarding climate change throughout the document to ensure the scientific accuracy and integrity of the SEIS.

In addition, EPA recommends that BLM incorporate a detailed analysis of need, consideration of pipeline infrastructure exacerbating carbon lock-in, and the potential for stranded assets in its SEIS for the Coastal Plain

⁶ IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press.

⁷ 2019 FEIS S-686.

⁸ Ahn et al. Atmospheric CO₂ over the last 1000 years: A high-resolution record from the West Antarctic Ice Sheet (WAIS) Divide ice core. <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2011GB004247>. May 26, 2012.

⁹ National Oceanic and Atmospheric Administration. Climate Change: Atmospheric Carbon Dioxide. <https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide>. August 14, 2020.

¹⁰ IPCC (2021) Climate Change 2021, The Physical Science Basis, Summary for Policymakers.

¹¹ EPA. Climate Change Indicators: Climate Forcing. <https://www.epa.gov/climate-indicators/climate-change-indicators-climate-forcing>. Accessed August 2021.

leasing program. Furthermore, BLM should assess in detail the extent to which the program is inconsistent with global policy to limit GHG emissions, including pathways to achieving net-zero emissions. In regard to climate resiliency, we recommend that BLM specifically identifies how climate resiliency has been considered in the proposed action and alternatives.

GHG Emissions and Life Cycle Analysis

EPA recommends that the SEIS include a detailed discussion of the Coastal Plain leasing program's GHG emissions in the context of national and international GHG emissions reduction goals, including the U.S. 2030 Paris GHG reduction target and a 2050 net-zero pathway. We recommend that discussion address the increasing conflict over time between continued GHG emissions and GHG emissions reduction goals. This would provide decisionmakers and the public essential context regarding the program's long-term GHG emissions and essential emissions reduction policies.

EPA recognizes the importance of reliable tools for GHG estimates and supports the decision to include a life cycle analysis in the SEIS. Recent studies demonstrate the applicability of life cycle analyses and provide indications of substantial emissions at various upstream and downstream stages.^{1,12,13} We advise BLM to solicit information from lessees in the National Petroleum Reserve-Alaska, and the Coastal Plain, to develop estimates about the amount of fuel production and transportation that will occur if the projects under the leasing program proceed, including estimates that underlie the economic rationale and financing for existing or proposed projects. This would allow for robust analysis and public review process to occur, so that any potential questions regarding the validity or completeness of such information would be answered. By incorporating this high-quality information, BLM would be able to assess these direct and indirect emissions more accurately. This would also assist BLM in its determination of the significance of the potential impacts, whether alternative options should be selected, and whether mitigation measures should be implemented. We encourage BLM to clearly disclose any assumptions made in the analysis.

The life cycle analysis should clearly define all elements considered as upstream, midstream, and downstream. Often, upstream is considered those activities which are associated with exploration, development, and production of resources, midstream refers to activities to transport and store crude oil and natural gas before they are refined and processed into fuels, and downstream often refers to the refining and processing activities that use crude oil and natural gas to produce the fuels and finished products used or combusted by consumers.

- For each stage in the supply chain a clear description of activities and corresponding estimated GHG emissions should be provided.
- As information on analogous regional sources of petroleum and natural gas are known, estimation of upstream emissions associated with extraction and processing is feasible. In instances where the source is unconstrained, we recommend consulting the references provided above to estimate possible upstream emissions. We also refer BLM to the [Oil Production Greenhouse Gas Emissions Estimator](#) (OPGEE) tool to aid in the upstream emissions analysis.
- To better understand the cumulative GHG impacts, BLM should describe the regionally known hydrocarbon accumulations, each field (based upon best available exploration, discovery, and analog field information) should be included and used to provide a comparison of the originally estimated recoverable resources and reported present recovered reserves. BLM can use this information to analyze the forecasted increase of potential GHG emissions due to technological advances and infield drilling at the proposed developments that may occur under the leasing program.¹⁴

¹² Gordon et al. Know Your Oil – Creating a Global Oil-Climate Index. https://carnegieendowment.org/files/know_your_oil.pdf. 2015. Accessed August 2021.

¹³ National Energy Technology Laboratory. Life Cycle Greenhouse Gas Perspective on Exploration Liquified Natural Gas from the United States. <https://www.energy.gov/sites/prod/files/2019/09/f66/2019%20NETL%20LCA-GHG%20Report.pdf>. September 2019.

¹⁴ In 2000, the Alpine Oil Pool (Alpine and Nanuq Kuparuk participating areas) was originally estimated to be 423 million barrels of recoverable reserves. In 2020, it was reported that the combined pool had produced 504.4 million barrels of oil cumulative since startup. This equates to approximately 75,400,000 barrels of oil over the original estimate. We note production is ongoing.

- It is important to estimate potential midstream air quality impacts to communities with EJ concerns.

We encourage BLM to draw from historical data (such as those provided from developments in the North Slope). A potentially useful resource is the *2015 Know Your Oil: Creating a Global Oil-Climate Index* report.

- For example, the primary petroleum end-products of oil derived from the North Slope include gasoline, diesel, jet/aviation fuel, and residual fuel oil.
- End-product combustion-related emissions can be determined using the relative proportions of the end products and emission factors provided by EPA.¹⁵

EPA recommends that BLM discuss the potential significance of GHG emissions. This is because the 2019 FEIS states that over an estimated 70-year production and consumption period, the direct average annual GHG emissions will be approximately 56,739 to 378,261 metric tons of CO₂-equivalent (CO₂e) per year, and the indirect GHG emissions will be about 5,000,000 metric tons of CO₂e per year.¹⁶

The SEIS should discuss the potential significance of methane and other volatiles emissions. For example, bottom-up approaches that estimate emissions from various sources of equipment during ideal operating conditions do not adequately characterize methane emissions. This is because often only a small percent of natural gas leak sources are responsible for most of the total volume of leaked gases.¹⁷

Finally, EPA recommends the SEIS incorporate an analysis of future market demands and reliance/competition with alternate energy sources over time. For example, the SEIS could explore decarbonization measures to reduce emissions at downstream liquified natural gas (LNG) plants (such as providing power through alternative sources). Additional questions BLM should consider as it develops the SEIS include:

- Would the oil or gas reserve primarily displace existing generation from “dirtier” sources, or is the export intended to support increased energy demand?
- How may the oil or gas produced displace the use of other renewable resources being developed?

Monetizing Impacts from GHG Emissions

Estimates of the social cost of greenhouse gases (SC-GHG¹⁸) can be informative for assessing the impacts of GHG emissions and are regularly used to inform decisions like those being considered by BLM. SC-GHG estimates allow analysts to monetize the societal value of changes in carbon dioxide and other GHG emissions of actions that have small, or marginal, impacts on cumulative global emissions. Estimates of social cost of carbon (SC-CO₂) and other GHG (e.g., social cost of methane (SC-CH₄)) have been used for over a decade in federal analyses, while acknowledging the uncertainties involved and clearly understanding the need for updates over time to reflect evolving science and economics of climate impacts. Even absent a full benefit-cost analysis, where it is possible to develop a reasonable estimate of the net changes in direct and indirect GHG emissions resulting from a proposed project (i.e., relative to a no action alternative), the use of SC-GHG estimates can provide useful information in BLM’s environmental review. A discussion of the SC-GHG estimates used in recent federal benefit cost analysis (BCA) can be found in EPA’s supporting documents for the Revised Cross-State Air Pollution Rule (CSAPR) Update Rule.¹⁹ Specifically, the estimates used in the BCA of the Revised CSAPR rule are the interim SC-GHG estimates that EPA and other members of the Interagency Working Group on the Social Cost of Greenhouse Gases (IWG) developed under Executive Order 13990. These interim SC-GHG estimates are available until an improved estimate of the impacts of climate change can be developed based on the best

¹⁵ EPA. EPA Center for Corporate Climate Leadership, GHG Emissions Factors Hub. <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>. Accessed August 2021.

¹⁶ 2019 FEIS 3-8, 3-9.

¹⁷ https://www.epa.gov/sites/default/files/2016-08/documents/clearstone_ii_03_2006.pdf.

¹⁸ EPA uses the general term, “social cost of greenhouse gases” (SC-GHG), where possible because analysis of GHGs other than CO₂ are also relevant when assessing the climate damages resulting from GHG emissions. The social cost of carbon (SC-CO₂), social cost of methane (SC-CH₄), and social cost of nitrous oxide (SC-N₂O) can collectively be referenced as the SC-GHG.

¹⁹ https://www.epa.gov/sites/default/files/2021-03/documents/revised_csapr_update_ria_final.pdf.

available science and economics taking into consideration recommendations from the National Academies of Sciences, Engineering, and Medicine (National Academies, 2017).

EPA strongly recommends that BLM use estimates of the SC-GHG to disclose and consider the climate damages from net changes in direct and indirect GHG emissions resulting from the Coastal Plain Oil and Gas Leasing Program. To do so, EPA recommends the SEIS include a breakdown of estimated net GHG emission changes by individual gas, rather than relying on CO₂e estimates, and then monetize the climate impacts associated with each GHG using the corresponding social cost estimate (i.e., monetize CH₄ emissions changes expected to occur in 2025 with the social cost of methane (SC-CH₄) estimate for 2025 emissions).²⁰ When applying SC-GHG estimates, just as with tools to quantify emissions, BLM should disclose the assumptions (e.g., discount rates) and uncertainties associated with such analysis and the need for updates over time to reflect evolving science and economics of climate impacts.

Adaptation and Resilience

EPA suggests BLM make climate adaptation and resilience a priority consideration when preparing the SEIS. The long-time horizon associated with the development of the Coastal Plain program area makes it particularly important that the ongoing and projected impacts of climate change be considered. For example, it is not sufficient to ensure resilience of a proposed pipeline or development to risks under current climate conditions only. Considering potential projected climate change impacts helps ensure that investments made today continue to function and provide benefits, even as the climate changes.

Consider in the SEIS the ongoing and long-term risks posed by climate change regarding where oil and gas development infrastructure/facilities should be placed. The higher latitude regions are experiencing rates of temperature rise nearly double the global average. Alaska has experienced extensive permafrost thawing and associated ground subsidence (IPCC, 2021). The thawing of permafrost can be a source of significant carbon emissions, amplifying warming, and generating a complex feedback loop. This has global implications for climate change, but also regional physical impacts that may threaten critical infrastructure. If such infrastructure is placed in locations of elevated risk of damages due to climate change, design investments should be made to increase the resilience of the infrastructure to potential impacts now and in the future.

Given that climate change challenges communities throughout the U.S., particularly communities with EJ concerns, EPA recommends the SEIS discussion of climate impacts make apparent that while climate impacts may be manageable for certain communities, the impacts of compound extreme events can be greater than the “sum of the parts” as some communities or populations are at greater risk due to their locations, available infrastructure, and economic situations.

Accordingly, we also recommend that BLM consider climate resilience through the resulting exploration and development programs, requiring the applicant to incorporate climate resilient design as a project condition, since the Arctic is experiencing the impacts of climate change more rapidly than the rest of the world. This could be complemented by the development of a climate adaptation plan as appropriate.

Water Quality

EPA recommends BLM analyze the potential impacts from wastewater discharge, particularly how the increased load of pollutants from waste streams associated with oil and gas development (e.g., seawater treatment plant

²⁰ Transforming gases into CO₂e using Global Warming Potential (GWP) metrics, and then multiplying the CO₂e tons by the SC-CO₂, is not as accurate as a direct calculation of the social costs of non-CO₂ GHGs. This is because GHGs differ not just in their potential to absorb infrared radiation over a given time frame, but also in the temporal pathway of their impact on radiative forcing and in their impacts on physical endpoints other than temperature change, both of which are relevant for estimating their social cost but not reflected in the GWP. See the Interagency Working Group on Social Cost of Greenhouse Gases’ February 2021 *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990* for more discussion and the range of annual SC-CO₂, SC-CH₄, and SC-N₂O estimates currently used in Federal benefit-costs analyses.

discharges, gravel mine dewatering, and sanitary/domestic wastewater) are commonly discharged to surface waters.

We recommend the SEIS provide information and analysis regarding the potential discharges, including pollutants of concern likely to be present in the waste streams. BLM should also include information regarding potential facilities and their operations as available. We have previously recommended including more information about waste streams. For example, if the SEIS discusses a saltwater treatment plant, it should describe how it operates, its functional purpose, the associated pollutants, and their discharge concentrations in the waste stream that it produces as available. We recommend this type of inclusive analysis for any processing facilities or waste disposal (i.e., underground injection wells).

We also find it important that the SEIS use consistent definitions for blackwater, greywater, sanitary and domestic wastewater. EPA recommends utilizing the State of Alaska's definitions, as the state is the wastewater permitting authority under the Clean Water Act for the Coastal Plain program area.

Water Resources

We recommend that the SEIS describe how seasonal flooding may impact surface water quality, including analysis on how it increases the potential risk of accidental spills during flood events. High natural flooding during the spring break-up period is a concern throughout the Coastal Plain program area.

It is important for the analysis to include potential impacts that may result from flooding damages associated with production or injection wells or resulting from leaks or spills. Due to the active groundwater/surface water interaction in the program area, as evidenced by the substantial number of springs, surface activities and related impacts may also have the potential to impact groundwater quality.

We recommend that the SEIS provide information disclosing the existing drinking water resources in the leasing area (both surface water and groundwater sources of drinking water), particularly for local communities, and characterize the potential for impacts to the quality or quantity of those resources.

Wetlands

We recommend using plain language when discussing wetlands and vegetation types found in the leasing area. BLM should quantify the amount of each type of vegetation that could be impacted and discuss the relative importance of each type of vegetation within the ecosystem. By identifying the most valuable types of vegetation within the ecosystem, the decision-maker will be better informed as to the relative impacts of the different alternatives and whether certain vegetation types warrant additional protections under the proposed leasing program.

EPA recognizes that the program area is largely undisturbed and that the wetlands generally exist in reference-standard condition. As noted earlier, the Coastal Plain program area is home to over 200 migratory and resident bird species that rely on the functionality of this habitat resource.

Oil Spills

Reservoir

We recommend BLM analyze worst-case reservoir blowout scenarios for different areas that may be potentially offered for leasing due to the unknown nature of the petroleum reservoirs contained within the Coastal Plain program area.

The 2019 FEIS analyzed the statistical likelihood of an oil spill on the North Slope, which was determined to be highly unlikely, but potentially catastrophic. The FEIS presented 2,380 barrels as its assessed historical very large spill volume. For comparison, the 2018 Alpine Field and Satellites and Alpine Pipeline System Oil Discharge

Prevention and Contingency Plan is predicated on a model that shows that approximately 150,000 barrels would be discharged during a reservoir blowout from a well, with 70% (105,000 barrels) of the discharged oil landing on the drilling pad, and the rest on the surface lands and waters surrounding it. Use of the worst-case discharge information for analysis of potential exploration and development drilling within Coastal Plain program area will align the SEIS analysis with spill response documents that may be developed as a result of this leasing program.

BLM should use analogous North Slope field information to determine a reasonable daily rate of an uncontrolled flow of natural gas and oil from all potentially producible reservoirs into the open wellbore. This information can support more thorough oil spill analysis, particularly the duration of potential events and potential surface impacts to surrounding lands.

This analysis would help to reduce adverse subsistence, sociocultural, and public health impacts, as well as ensuring that potentially highly adverse impacts of a reservoir blowout to the land's hydrological, vegetation, and habitat conditions are minimized or avoided. Specific consideration should be given to the impacts to polar bears, caribou, and migratory birds.

Pipelines

EPA recommends that BLM analyze the impacts associated with a guillotine rupture of the potential pipelines that may be developed under the leasing program as a low-probability, high-impact scenario. This analysis should include the potential emissions impacts and the potential impacts of the spilled oil to the ecosystem, focusing on the potential degradation of the existing hydrological, vegetation, and habitat conditions.

The 2019 FEIS did not provide information on pipelines in discussions or figures regarding the relative rate of occurrence for spills from main sources. Analysis of the potential impacts of this situation will improve the understanding and disclosure of potential environmental impacts associated with the project, and better inform the mitigation and planning measures necessary for monitoring and control of the proposed pipelines during regular and emergency operations.

In 2013, the Alaska Department of Environmental Conservation (ADEC) stated as part of its North Slope Spills Analysis report that oil was spilled from several regulated sources, but the most impactful were those from flowlines²¹ (~6,390 barrels), facility oil piping (~6,170 barrels), storage tanks (~5,884 barrels), and oil transmission pipelines (~5,177 barrels). ADEC also reported that external corrosion was primary reason for these loss-of-integrity spills. Since flowlines and oil transmission pipelines are often outside of the protection offered by the well pad, we recommend analyzing on the potential impacts from these types of spills in addition to a guillotine rupture scenario.

Financial Assurance

EPA recommends that BLM require adequate financial assurance, for example, additional bonding, for exploration, development, and production projects that occur under the Coastal Plain leasing program to mitigate potential adverse impacts resulting from a release or oil spill, including a worst-case release or spill, to subsistence resources and the communities that rely on these resources in addition to adverse impacts to the environment.

Petroleum Resources

EPA provides several recommendations on the scope and direction of the analysis to support the Petroleum Resources section in the SEIS, and exploration and development NEPA documents that may result from the

²¹ Flowline {18 AAC 75.047; 18 AAC 75.990(173)}: "...that is installed or used for the purpose of transporting oil between a well pad... used for oil production and the interconnection point with a transmission pipeline"

Coastal Plain leasing program. We provide these recommendations since the causal chain of petroleum hydrocarbon is reasonably foreseeable and causally connected from extraction to combustion.

Geological Information

EPA recommends that BLM provide a thorough description of the petroleum resources, and how this understanding may change through time. EPA notes that many project specific EISs for oil development projects rely on programmatic data, or tier from historical NEPA documents. We recommend that BLM acknowledge the potential increase for production due to additional information from in-field drilling and/or technological advances.

This additional information will also allow the public and the decision-maker to better understand the cumulative GHG impacts. We recommend that BLM describe the regionally known hydrocarbon accumulations, each field (based upon best available exploration, discovery, and analog field information) should be included and used to provide a comparison of the originally estimated recoverable resources and reported present recovered reserves. BLM can use this information to analyze the forecasted increase of potential GHG emissions due to technological advances and infield drilling at the proposed developments that may occur under the leasing program.²²

Further, we recommend that BLM include the following information in the SEIS:

- Description of regional geology and hydrocarbon potential. This description should include analysis of the interpreted geologic features, coupled with an analysis of current and historic exploration and production activities.
- Scenario estimates for levels of post-lease oil and gas activity based on interpretation of available geologic data and the specific assumptions used for the potential methods required to extract oil and gas from the fields within the lease area.
- Analysis that identifies and explains a range of low, medium, and high hydrocarbon production levels.

Technological Advances

We advise BLM to conduct a regional assessment of how technological advances have changed the amount of petroleum hydrocarbon extracted from the North Slope by reviewing the initially estimated recoverable reserves, compared the current production values.

EPA recognizes that technological improvements continue to reshape oil and gas production, some for the better, like green well completions, vapor recovery units, engine upgrades for non-road vehicles, and closed loop drilling fluid systems. Some innovative approaches tend to generate greater environmental releases than those associated with conventional gas producing techniques. Nationally, the successful extraction of natural gas from unconventional resources required the invention of specialized drilling and completion techniques. This type of extraction tends to produce greater surface disturbances as well as large volumes of produced water. Similarly, although horizontal drilling techniques have emerged to connect more reservoir surface to the wellbore, unconventional development on a cumulative basis appears to be expanding the oil and gas industry's environmental footprint.

Future Projects

Information that should be included in project specific EISs:²³

- Description and figures showing the geophysical data used to evaluate the shallow geological and archaeological hazards.
- Discussion and figures showing the location, stratigraphy, and structure of the hydrocarbon resource(s).

²² See Footnotes 14 and 24.

²³ Proprietary business information is protected under the Freedom of Information Act. However, for NEPA documents to be adequately robust for Applications for Permits to Drill, which focus solely on the development of the reservoir, the information above is necessary.

- Description of the predicted rate profile for oil, water, and gas with the corresponding rate of injection for water and gas.
- Description of the reservoir rock properties, reservoir fluid properties and an estimate of the recoverable resources supported by information within the document
- Description of the subsurface depletion plan including well count, well placement, well profiles, well depth and bottom hole locations.
- Analysis of surface and subsurface conditions that may present hazards to rig set down, construction, drilling operations, production and processing operations, pipeline construction, and/or pipeline operation.

Mitigation

To minimize or avoid environmental harms caused by GHG emissions that exceed previous estimates, we recommend a mitigation measure that requires a NEPA adequacy review be completed if the barrels per day gross annual average is greater than 10% of the original barrels per day production target (disclosed in the development's most recent NEPA document) over a two-year period; or when the cumulative recovered reserves is greater than 10% of the original estimated recoverable reserves (disclosed in the development's most recent NEPA document). EPA's analysis indicates that with technological advances and new data provided by infield drilling following a development and production EIS, more petroleum hydrocarbons are often extracted from the reservoir than originally estimated.²⁴ This results in more GHG emissions produced than estimated or disclosed to the public. For example, if a development was estimated to produce 20,000 BOPD in its most recent NEPA analysis and is currently producing approximately 37,000 BOPD, a NEPA adequacy review could be conducted to capture this information. This information allows for more accurate cumulative analyses of oil and gas projects within the regional petroleum basin(s).

For future development project EAs and/or EISs that result from the Coastal Plain leasing program, EPA recommends that BLM ensure that these documents include geological and geophysical information that supports the estimates of the recoverable reserves. Development forecasts and production estimates should be used to support the scale, accuracy, and veracity of the potential oil spills, GHG emissions and SC-GHG estimates and analysis. BLM should use this information to support its NEPA adequacy reviews for development projects that may result from the Coastal Plain leasing program.

EPA recommends including midstream, e.g., activities to transport and store crude oil and natural gas before they are refined and processed into fuels, assessments into BLM's GHG analysis. The 2019 FEIS describes a natural gas transport pipeline from the North Slope to southcentral Alaska, where the gas would be transformed into LNG and transported for refinement and use. We recommend that BLM consider encouraging project proponents to use co-occurring gas to be reinjected to maintain reservoir pressure or, instead, used to manufacture natural gas liquids to blend and transport with the oil in existing infrastructure.

Subsistence Economics

EPA recommends the use of the replacement cost method (RCM) to quantify the monetary cost of replacing subsistence foods that may be lost because of lease activities. RCM is a standard technique for evaluating the dollar value of an ecosystem service (Brown & Burch, 1992; Hougner, Colding, & Soderqvist, 2006). Project infrastructure has the potential to cause loss of subsistence areas due to direct overlap, as stated by BLM. When subsistence foods are not available, nutritionally comparable substitutes must be purchased, placing a direct financial burden on subsistence users in the form of lost harvest, as well as an indirect burden from stranded assets that users purchase for harvest activities (e.g., nets, fishwheels, snow machines).

²⁴ The Northstar Final EIS, completed in 1999 by USACE, states that the reservoir contains an estimated 260 million barrels of original oil in place. Well tests that were conducted during the exploration phase, and coupled with results of detailed reservoir studies, indicated that the recoverable reserves were about 158 MMBOE, leading to the determination that the operational design life of the reservoir would be approximately 15 years. As of 2021, the State of Alaska notes that approximately 178.3 MMBOE have been produced by Northstar, meaning that the original geological assessments underestimated by approximately 20.3 MMBOE. This discrepancy was likely caused by not appropriately acknowledging the benefit of technological improvements or the ability of in-field drilling to help delineate the reservoir to maximize extraction. We note production is ongoing.

Estimates have been calculated for the replacement value of subsistence foods in general (Guettabi et al. 2016; Alaska Dept. of Fish and Game, Division of Subsistence, 2014), and these estimates can be applied to total subsistence harvests for affected communities listed in 2019 FEIS Appendix M. Consideration should also be given to the most similar commercially available product that would replace subsistence products that represent a significant portion of a community's total harvest, such as caribou, bowhead whale, or salmon.

Given the high nutritional and cultural value of subsistence food within Alaska, EPA recommends analyzing the potential impacts of the proposed Coastal Plain leasing program to the regional subsistence economies. We also recommend BLM consider the unique cumulative impacts caused by remote geography, regional food equity and importance of subsistence way-of-life practices experienced by communities in proximity to the Coastal Plain program area. EPA finds it important that BLM analyze the impacts that the Coastal Plain leasing program may have to the ability of these communities to maintain their existing subsistence economies.

Environmental Justice

Analysis

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 16, 1994), directs federal agencies to identify and address, as appropriate, disproportionately high, and adverse human health or environmental effects of their actions on minority and low-income populations to the greatest extent practicable and permitted by law. It further directs agencies to develop a strategy for implementing EJ and providing minority and low-income communities access to public information and public participation.

It is important to note that minority and low-income can be measured in various ways. A minority population does not need to meet a 50 percent threshold if “the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.”²⁵ To best illustrate the presence of a minority population, we recommend that BLM analyze block groups, the smallest geographical unit that the U.S. Census Bureau publishes data for. We caution using larger tracts in the analysis, such as counties or cities, as these may dilute the presence of minority populations.

The NEPA Committee of the Federal Interagency Working Group on EJ has noted that, in some cases, it may be appropriate to use a threshold for identifying low-income populations that exceeds the poverty level.²⁶ For this project, there may potentially be some low-income populations that may not be accurately recognized by U.S. Census Bureau data if the analysis does not account for areas with high housing costs or other critical family expenses and resources.

Existing screening tools do not currently capture certain demographic characteristics of rural Alaskan communities, such as their remote nature and the high-cost burden of transportation, that may present EJ concerns. As such, EPA recommends that the BLM consider the definition of “disadvantaged community” as referenced in EO14008 and further described in the Interim Implementation Guidance for the Justice40 initiative, which direct agencies to consider a range of specific demographic and environmental variables when assessing a community.

We recommend that BLM refer to the EPA document titled, “Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts” which presents research on the disproportionate risks to low-income and

²⁵ Council on Environmental Quality. Environmental Justice: Guidance Under the National Environmental Policy Act. December 1997. Available at https://www.epa.gov/sites/production/files/2015-02/documents/ej_guidance_nepa_ceq1297.pdf.

²⁶ Federal Interagency Working Group on Environmental Justice & NEPA Committee. Promising Practices for EJ Methodologies in NEPA Reviews. March 2016. Available at: https://www.epa.gov/sites/production/files/2016-08/documents/nepa_promising_practices_document_2016.pdf.

minority populations posed by climate change.²⁷ “According to the Fourth National Climate Assessment (NCA4), the impacts of climate change will not be equally distributed across the U.S. population. Those who are already vulnerable due to a range of social, economic, historical, and political factors have a lower capacity to prepare for, cope with, and recover from climate change impacts. Understanding the comparative risks to vulnerable populations is critical for developing effective and equitable strategies for responding to climate change.”

In the SEIS, we recommend BLM identify if there are potential adverse environmental or human health effects of the proposed project on minority and low-income communities. We encourage BLM to use EPA’s EJSCREEN tool for initial EJ screening efforts and then use the most recent American Community Survey from the U.S. Census Bureau (i.e., 2014–2018) to determine the presence of minority and low-income populations. Refer to the Federal Interagency Working Group on EJ & NEPA Committee document titled, “Promising Practices for Environmental Justice Methodologies in NEPA Reviews” for recommendations on addressing information and analysis methods to assist in identifying communities with environmental justice concerns.

After BLM has determined if minority and low-income populations exist in the Coastal Plain program area, we recommend that the SEIS discuss whether these communities would be potentially affected by individual or cumulative actions of the proposed action. Address whether any of the alternatives would cause any disproportionate adverse impacts, such as higher exposure to toxins; changes in existing ecological, cultural, economic, or social resources or access; cumulative or multiple adverse exposures from environmental hazards; or community disruption. We describe elsewhere in this letter our specific recommendations on this topic regarding potential impacts to air quality and subsistence foods.

If it is determined that minority and low-income populations may be disproportionately impacted, describe in the SEIS the measures taken by BLM to fully analyze the environmental effects of the action on minority communities and low-income populations and identify potential mitigation measures. Clearly identify a monitoring and adaptive management plan to ensure that mitigation is effective and successful.

Present opportunities for affected communities to provide input into the remainder of the NEPA process and the project construction timeline. In the SEIS, include information describing what was or will be done to inform these communities about the project and the potential impacts it will have on their communities (notices, mailings, fact sheets, briefings, presentations, translations, newsletters, reports, community interviews, surveys, canvassing, telephone hotlines, question and answer sessions, stakeholder meetings, and on-scene information), what input has been received to date from the communities, and how that input was or will be used in decision-making.

Mitigation

As stated in our 2019 FEIS letter, EPA recommends analysis of specific mitigation measures that would ensure that permitted activities do not create human health risks by contaminating subsistence foods. The potential for disproportionate adverse subsistence, sociocultural, and public health impacts to communities with environmental justice concerns, including Kaktovik, Nuiqsut, Arctic Village, and Venetie, remains a key concern regarding potential future oil and gas activity on leases within the Coastal Plain. We continue to support measures and decisions that minimize or avoid impacts to subsistence resources, particularly caribou habitat, because of these concerns.

Consultation with Tribal Governments

We advise that EO 13175, *Consultation and Coordination with Indian Tribal Governments* (November 6, 2000) was issued to establish regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, and to strengthen the United States government-to-government relationships with Indian Tribes. In 2009, the Presidential Memorandum on Tribal Consultation was

²⁷ EPA. 2021. Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. U.S. Environmental Protection Agency, EPA 430-R-21-003. www.epa.gov/cira/social-vulnerability-report

issued, and required each agency to prepare and periodically update a detailed plan of action to implement the directive of EO 13175. In January 2021, a Presidential Memorandum reaffirmed the US Government's commitment to these policies.

In the SEIS, we recommend BLM describe the process and outcome of government-to-government consultation between BLM and the tribal governments within the project area, issues that were raised (if any), and how those issues were addressed in the selection of the proposed alternatives. As a general resource, EPA recommends the document Tribal Consultation: Best Practices in Historic Preservation, published by the National Association of Tribal Historic Preservation Officers.²⁸

Migratory Birds

EPA recommends the following considerations be included in the analysis for impacts to migratory birds:

- Discussion of the potential impacts of climate change to migratory birds that will occur over the duration of potential development scenarios within the Coastal Plains program area, specifically loss of habitat due to permafrost degradation, and increased frequency of bird strike due to an anticipated rise in Arctic shipping.
- Discussion in the oil spill analysis section should include impacts to birds using more accurate spill volumes (as discussed elsewhere in this letter), and the potential long-term impacts resulting from an oil spill to migratory birds.
- Analysis of the habitat impacts experienced by these birds along their migratory routes. This is because of the wide range of climate change impacts experienced by migratory birds in their various habitats. For example, droughts that are experienced by migratory birds along their migration routes through the continental United States, are expected to increase in duration and intensity due to climate change. This means that migratory birds will experience decreased habitat size and function and diminishing food availability along their migratory routes in the future. Therefore, climate change induced droughts increase the importance of the Coastal Plain wetlands as protected habitat.

EPA recommends analyzing a mitigation measure that restricts leasing in wetland habitats within the Coastal Plain program area for the purpose of avoiding or reducing impacts to migratory birds by the means of habitat conservation.

Habitat Function and Sustainability

Reclamation

We reaffirm our recommendation that BLM should include the Federal land formerly containing production and support facilities to count towards the cumulative 2,000-acre limit. This is because the 2019 FEIS stated that disturbances from seismic testing in 1984 and 1985 remain, which means that the disturbance has remained so for over 35 years and is presently not regarded as fully restored. As stated in the EPA's comment letter on the 2019 Final EIS: the methods by which the BLM will determine when acreage has been reclaimed remains unclear. In previous response to comments, BLM acknowledged that returning full habitat function can take longer in the Arctic than elsewhere and that reclamation must be adequate before the disturbed acreage will be available for reuse by facilities. EPA believes that a site may be considered restored to its previous condition when the site condition measurements fall within the range of variability measured at the site pre-disturbance or at an undisturbed reference site.

Mitigation

²⁸ See http://www.nathpo.org/PDF/Tribal_Consultation.pdf

We recommend analysis and development of a mitigation measure regarding sustainable construction practices to reduce impacts to specific environmental resources (e.g., use of impermeable liners, harvesting the organic layer for use in reclamation, minimizing alteration of sheetflow, use of weed-free gravel).